# Evolvable Cryogenics (eCryo)

Completed Technology Project (2014 - 2020)

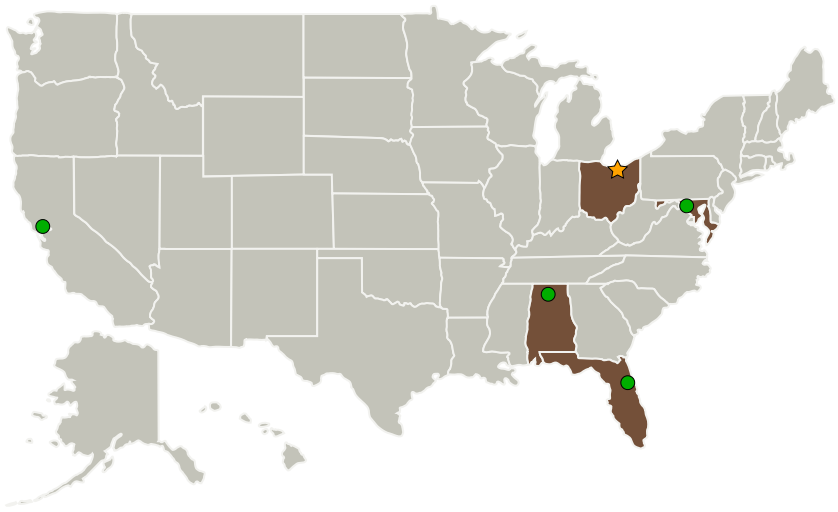
## Project Introduction

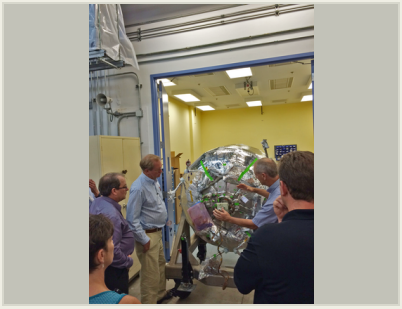
eCryo leverages a multi-Center array of enhanced test facilities and new test rigs to mature cryogenic fluid management technologies that are supportive of future exploration propulsion needs and upgraded versions of the Space Launch System (SLS) - from components to entire systems, at a scale relevant to the envisioned applications. Specifically, eCryo will equip mission designers with the knowledge necessary to extend mission durations and increase mission payload capacity for space exploration systems employing cryogenic fluids.

## Anticipated Benefits

Demonstrated eCryo technologies will equip mission designers with validated models to predict cryogenic fluid behavior for in-space missions and technologies to extend missions employing cryogenic fluids.

## Primary U.S. Work Locations and Key Partners





Cryogenic test article used to evaluate Multi Layer Insulation (MLI).

## Table of Contents

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Glenn Research Center(GRC) | Lead Organization | NASA Center | Cleveland, Ohio |
| ●Ames Research Center(ARC) | Supporting Organization | NASA Center | Moffett Field, California |
| ●Goddard Space Flight Center(GSFC) | Supporting Organization | NASA Center | Greenbelt, Maryland |
| ●Kennedy Space Center(KSC) | Supporting Organization | NASA Center | Kennedy Space Center, Florida |
| ●Marshall Space Flight Center(MSFC) | Supporting Organization | NASA Center | Huntsville, Alabama |

| Co-Funding Partners | Type | Location |
|---|---|---|
| Space Technology Mission Directorate(STMD) | NASA Mission Directorate | |

| Primary U.S. Work Locations | |
|---|---|
| Alabama | Florida |
| Maryland | Ohio |

### Project Transitions

**April 2014:** Project Start

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Glenn Research Center (GRC)

**Responsible Program:**

Technology Demonstration Missions

## Project Management

**Program Director:**

Trudy F Kortes

**Program Manager:**

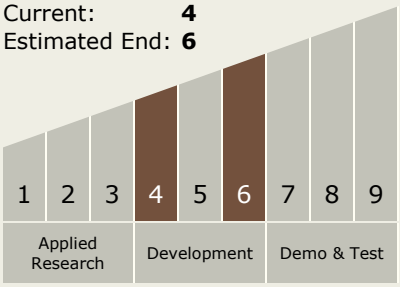
Tawnya P Laughinghouse

**Principal Investigator:**

Hans C Hansen

## Technology Maturity (TRL)

Start: **4**
Current: **4**
Estimated End: **6**



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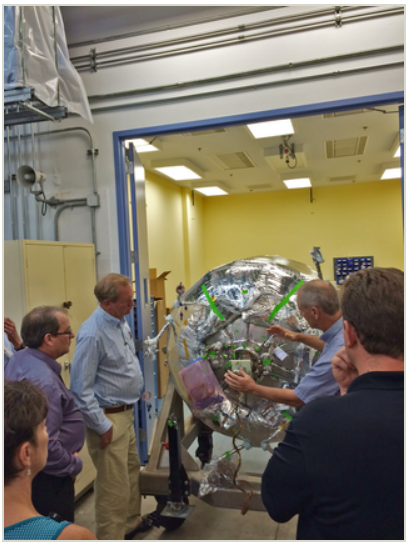
**September 2020:** Closed out

**Closeout Summary:** eCryo consisted of a product-based portfolio of CFM technologies managed per the WBS structure under NPR 7120.8, with technical products under WBS 4.0 Technology Development and 5.0 Validation & Test. The products under WBS 4.0 Technology Development included: Development and Validation of Analytical Tools (DVAT), Improved Fundamental Understanding of Super Insulation (IFUSI), Radio Frequency Mass Gauge (RFMG), High Accuracy Delta-P Transducer (HADPT), and Valve Seat Leak Test (VSLT). The products under WBS 5.0 Validation & Test include: Integrated Vehicle Fluids (IVF), Structural Heat Intercept Insulation Vibration Evaluation Rig (SHIIVER), and Large Scale Leakage Fixture (LSLF). Over the six year life of the project, key performance parameters were met in all previously listed technology developments. Technology development for the project culminated with the SHIIVER test which provided a large scale test apparatus to evaluate MLI, vapor cooling, and RFMG technologies.

**Closeout Link:** https://www.nasa.gov/sites/default/files/atoms/files/ecryo_overview_paper_final.pdf

## Images



**Evolvable Cryogenics (eCryo).png**
Cryogenic test article used to evaluate Multi Layer Insulation (MLI).
*(https://techport.nasa.gov/image/100907)*

## Technology Areas

**Primary:**

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.1 Integrated Systems and Ancillary Technologies

## Target Destinations

Earth, The Moon, Mars

## Supported Mission Type

Push

## Links

TDM's eCryo site
*(https://www.nasa.gov/mission_pages/tdm/ecryo/index.html)*

## Project Website:

https://www.nasa.gov/mission_pages/tdm/main/index.html#.VQb6XUjJzyE